Feb. 26, 1935. A. G. SCHURICHT 1,992,244

PROCESS OF MAKING BULLETS

Filed July 29, 1927

Fig. 1.

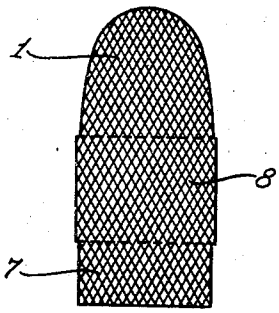


Fig. 2.

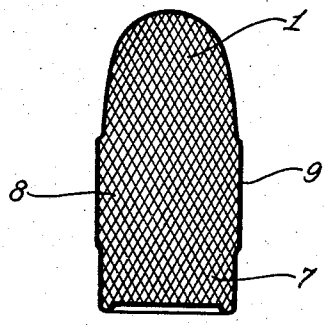


Fig. 3.

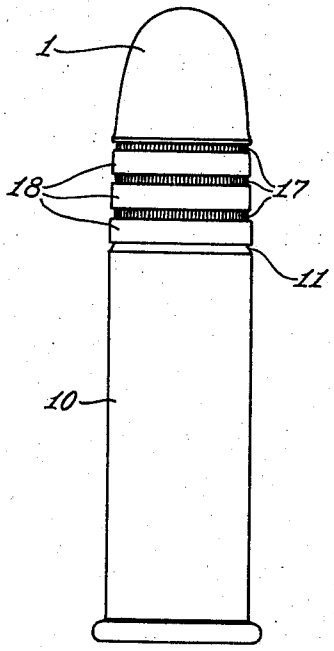


Fig. 4.

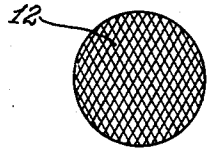
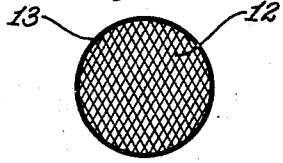


Fig. 5.



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Patented Feb. 26, 1935

1,992,244

UNITED STATES PATENT OFFICE

1,992,244

PROCESS OF MAKING BULLETS

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Application July 29, 1927, Serial No. 209,195

2 Claims. (Cl. 204—10)

This invention relates to bullets or projectiles such as rifle bullets, shot gun shot, balls, etc., and more particularly to a bullet embodying a slug of lead or a lead alloy plated with copper. This invention is a further development of that of Patent No. 1,732,211, October 15, 1929.

In the manufacture of lead or lead alloy bullets, the characteristics thereof are greatly improved by plating the same with copper, especially if secured by electrodeposition. However, a closely cohering plating cannot be secured where the electrodeposition is in an acid solution or electrolyte, such as copper sulphate; nor is the plating dense or hard, but rather spongy. This is believed to be due to a number of causes, among which may be mentioned the following: the acid sulphate solution reacts chemically with the lead, coating the same with a film of lead sulphate, which not only prevents the copper from cohering to the lead, but also prevents a dense and homogeneous plating from being built up; furthermore, since lead is above copper in the electrochemical series, deposition of copper on the lead occurs by immersion, which results in the deposit being spongy. A non-cohesive spongy plating does not, however, give such a coating for a bullet as is desirable.

One of the objects of this invention, therefore, is to provide a copper plated lead or lead alloy bullet and process of making the same, whereby the copper plating will not only closely and firmly cohere to the lead slug or core, but in which this plating will be dense, hard and homogeneous.

Another object is to provide a process which is readily controllable and in which the plating may be carried out in a simple, expeditious and economical manner.

Further objects will appear from the detail description, taken in connection with the accompanying drawing, in which—

Figure 1 is a section, considerably enlarged, of a lead or lead alloy slug formed to provide a small calibre rifle bullet;

Figure 2 is a similar view, showing the plating applied;

Figure 3 is a view showing the bullet mounted and secured in its cartridge shell;

Figure 4 is a section, somewhat enlarged, of a lead or lead alloy slug formed to provide a shot shell shot; and

Figure 5 shows the slug of Figure 4 plated.

One of the features of this invention, generally stated, resides in the fact that the copper plating is deposited on the lead or lead alloy slug in an alkaline electrolyte, such as alkaline cuprous cyanide. In accordance with a practical embodiment of this invention, the solution or electrolyte is maintained hot and agitated to secure a uniform plating, the concentration is maintained and the plating is mechanically condensed and burnished while the deposit proceeds.

While a satisfactory deposit is obtainable by an alkaline electrolyte, the latter is not susceptible of the ease of control, nor simplicity, as is the case where an acid electrolyte is used. Another feature of this invention, therefore, resides in the fact that the copper deposit is started in an alkaline electrolyte and finished in an acid electrolyte, such as copper sulphate. In accordance with a practical embodiment of this invention, a copper film is deposited or flashed on the lead or lead alloy slug or core in an alkaline electrolyte and the plating is then built up to the desired thickness in the acid electrolyte.

Where accuracy of formation is desired, as in the case of small calibre rifle bullets, the plating is condensed and conformed at the driving band so as to cause the plated band to accurately fit the rifling. In a practical embodiment of this invention, this condensation and conformation can be accomplished in any suitable manner, as by rolling or swaging the driving band to size.

Further features will appear from the detail description, in which will be described and illustrated practical embodiments of this invention; it will be understood, however, that this invention is susceptible of various other embodiments.

As a practical embodiment of this invention, the slug is formed to the desired shape as described in the Patent No. 1,732,211. Where the slug is to form a small calibre rifle bullet, such as for a .22 calibre rifle, the lead or lead alloy is suitably formed by a swaging die or in any other suitable manner, so as to provide a formation whose shape is that of the finished bullet, but whose volume is slightly below that of the finished bullet, in order to allow for the plating which is to be deposited. In a case where the slug is designed to form the core of a shot shell shot, the lead alloy can be formed in any suitable manner, as in a shot tower; in such a case, however, it is desirable that graphiting and grease be avoided as much as possible. Where the slug is to form the core of a ball, such as the single ball used in a shot shell, the formation thereof can be secured in any suitable manner.

In whatever manner the slug is formed, the surfaces thereof are cleaned so as to permit a cohering plating to be deposited thereon; this

may be secured by tumbling the slugs in a hot solution of soda ash until they are perfectly clean. The slugs are then rinsed in hot water until all traces of the cleaning solution have been removed; this is essential so as to prevent the plating bath or electrolyte from becoming contaminated. The slugs are now ready to be plated.

An alkaline electrolyte suitable for depositing a copper plating on a lead or lead alloy slug is secured by a solution of cuprous cyanide and sodium cyanide in the proportion of 6.4 oz. of the former and 8 oz. of the latter for each gallon of solution. This solution may be used either hot or cold; it is, however, advantageous to use a hot solution maintained at a temperature between 110° F. and 130° F. The anode is preferably of pure copper, containing 99+% copper. The concentration of the solution is controlled by chemical analysis, additional of the electrolyte base being added when the concentration drops below a given point; this enables uniform results and a predetermined plating to be attained.

In order to secure a uniform plating, circulation and agitation should be provided for in order that all surfaces of the slug being plated are uniformly exposed. Furthermore, it is desirable that the plating be condensed and burnished while the deposit proceeds. These two results can be achieved by carrying out the plating in a tumbling barrel or barrel plater. In such an apparatus the slugs are placed in the plating barrel, which may be a closed drum revolving on a horizontal axis in the electrolyte. The anodes are suspended in the bath so that the barrel revolves between them; greater efficiency may, however, be obtained by placing an additional anode on the inside of the barrel. Another type of apparatus which may be used is an oblique barrel open at one end, the closed end being connected with a driving shaft and the whole mounted at an angle so that the barrel is in an oblique position, with its open end up. The slugs and the electrolyte are placed in the barrel while the anode is suspended from an arm so that it is immersed in the electrolyte. Where an alkaline cyanide electrolyte is used, brass and aluminum should be avoided, and all metal parts should be made of steel. A phenol condensation product, such as Bakelite, is an excellent material to use, since it is not attacked by the electrolyte.

In the plating of lead bullets designed for small calibre rifles and in which the form of the bullet must be accurately maintained, it is necessary to have provisions preventing de-formation of the bullet during the tumbling action. Such deformation is prevented by floating the bullets in shot or balls during the plating and tumbling operation. The shot or balls also perform the additional function in that they condense and burnish the plating during the deposit thereof and so as to provide a polished and smooth finish; moreover, the lead shot are themselves plated and the plating thereon condensed and burnished. It has been found that improved results are attained when equal parts by weight of rifle bullets and shot forming slugs are tumbled and plated together. It is not, however, necessary to use lead shot or balls, as balls of other materials, even of non-conducting material, such as glass, porcelain, quartz, etc., may be used.

Where the plating is to be finished in an alkaline solution, it is proceeded with until the desired thickness has been attained, care being used to maintain the concentration. In practical operation, however, a film is deposited or flashed on the lead or lead alloy slug until the latter is entirely covered with copper. The slugs are then transferred to an acid electrolyte of copper sulphate, where the plating is continued until the desired thickness is obtained. The copper sulphate solution may be the usual solution, and the plating may be in accordance with the usual practice of depositing copper. Since, now, however, the lead or lead alloy core has received a plating of copper in the alkaline solution, deposit by immersion will not take place, nor will any lead sulphate be formed, but the copper will be deposited from the sulphate solution on the copper film previously deposited so that a dense, hard and homogeneous coating will be attained. Since the concentration of the solution is maintained by solution of the anode, and since higher current and densities may be employed, the plating is carried out expeditiously, conveniently and economically.

After plating of the slugs, they are rinsed in hot water in a tumbling barrel with runing hot water until the plating solution has been washed off. The plated slugs are then dried in any suitable manner, as by air, centrifuge, or by tumbling with saw dust, either with or without the application of heat.

The drawing illustrates embodiments of this invention. In Figure 1 a formed slug designed to provide a rifle bullet is shown at 1 and, as shown, it is provided with a driving band 8 and a reduced part 7 adapted to fit the shell. In Figure 2 the plating is shown at 9. The plated bullet may now be placed in a shell 10 (Figure 3) and subjected to operations which crimp the shell on the bullet, as shown at 11, while the driving band is formed down to size, as shown at 18; canelures, as shown at 17, may also be provided. These operations may be performed in any suitable manner as described in Patent No. 1,732,211, the object being to not only size the driving band to accurately fit the rifling, but also to additionally condense and burnish the plating. In Figure 4 is shown the core 12 of a shot or ball, which has the plating 13 applied thereto as shown in Figure 5.

It will, therefore, be seen that the invention accomplishes its objects. A closely cohering, dense and homogeneous plating is formed on the core or slug in order to provide an efficient bullet or projectile designed for the use for which it is intended; the plating operations are not only simple but economical. In a case where the plated slug forms a rifle bullet, not only is the plating condensed, especially at the driving band, but the latter is accurately conformed to fit the rifling so that its accuracy is increased, while leading of the rifling barrel is avoided. In the case of shot and balls, the form thereof is not only maintained, but deformation is prevented, even while passing through the gun barrel, so that the accuracy and pattern of the projectile charge are improved. The plating may be of a thickness to suit requirements; in a .22 calibre rifle bullet, a practical thickness is .0005 inch; however, a somewhat thicker or thinner plating may be employed. In shot the plating may be thicker, .001–.005, the object being to provide a plating of sufficient stability to prevent deformation of the shot under the conditions encountered.

While the terms "slug" and "bullet" are used, it is to be understood that these terms are used descriptively and not limitatively, so as to comprehend cores for and projectiles designed to form rifle bullets, shot, balls, etc. It will further

be understood that certain features, operations and sub-combinations are of utility and may be employed without reference to other features, operations and sub-combinations; that is contemplated by and is within the scope of the appended claims. It is furthermore obvious that various changes may be made in details and operations, within the scope of the appended claims, without departing from the spirit of this invention. It is, therefore, to be understood that this invention is not limited to the specific details and operations shown and/or described.

Having thus described the invention, what is claimed is:

1. In the art of making bullets, the process comprising, depositing a plating of copper on a lead slug in an alkaline electrolyte while the plating is being mechanically condensed or burnished.

2. In the art of making small calibre rifle bullets, the process comprising, depositing a plating of copper on a lead slug in an alkaline electrolyte and condensing and conforming the plated slug at the driving band so as to fit the rifling.

ALFONS G. SCHURICHT.